

Science Makes Jobs

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# THE SCIENTIFIC MONTHLY

APRIL, 1934

## THE CONTRIBUTIONS OF SCIENCE TO INCREASED EMPLOYMENT<sup>1</sup>

### A LETTER FROM PRESIDENT ROOSEVELT<sup>2</sup>

The value to civilization of scientific thought and research cannot be questioned. To realize its true worth one has only to recall that human health, industry and culture have reached, in a century of scientific progress, a far higher state than ever before.

The idea that science is responsible for the economic ills which the world has recently experienced can be questioned. It would be more accurate to say that the fruits of current scientific thought and development, properly directed, can help revive industry and the markets for raw materials.

## SCIENCE MAKES JOBS

By Dr. KARL T. COMPTON

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THE idea that science takes away jobs, or in general is at the root of our economic and social ills, is contrary to fact, is based on ignorance or misconception, is vicious in its possible social consequences, and yet has taken an insidious hold on the minds of many people. Conscious of the fallacy of this idea, but

<sup>1</sup> A symposium on "Science Makes More Jobs" presented at a joint meeting of the American Institute of Physics and the New York Electrical Society at the Engineering Auditorium in New York on February 22. The address of Dr. Coolidge was broadcast from Schenectady by the National Broadcasting Company.

<sup>2</sup> A letter addressed to President Karl T. Compton, chairman of the American Institute of Physics, on the occasion of the symposium.

characteristically intent on their work and averse to publicity, the productive scientists of the country have thus far taken little or no part in discussions of the subject.

It has become evident, however, that the spread of this idea is threatening to reduce public support of scientific work, and in particular, through certain codes of the N.R.A., to stifle further technical improvements in our manufacturing processes. Either of these results would be nothing short of a national calamity —barring us from an advanced state of knowledge and standard of living and soon placing us at an economic disadvantage in respect to foreign countries

who have not let themselves be swayed by such a short-sighted point of view.

Consequently the New York Electrical Society and the American Institute of Physics are combining in a national service to combat this insidious and dangerous propaganda. They do not, of course, hold that scientific and technical advances have not brought difficulties, like social growing pains. But they strive to prevent us from killing the goose that lays the golden eggs, just because some of these eggs happen to be tarnished. They would advocate careful attention to polishing the eggs and encouraging the goose to lay more of them. In other words, they advocate intelligent and effective attention to remedy each social and economic difficulty as has accompanied the advance of science, and at the same time they advocate the further advancement of science and its applications for human welfare just as vigorously as possible. They do this because the effects of science on human welfare are preponderatingly good and beneficial.

Now we might select any or all of the effects of science on human welfare as the chief point of our discussion tonight. We might, for example, call attention to the effects of medical science. Where would we be to-day without medical science, which has one by one eradicated or brought under control those diseases which used to plague mankind and occasionally to decimate his numbers? Before the days of science these were thought to be the results of the displeasure of gods and demons. Where would we be to-day without the sanitary engineer who safeguards our milk supply and provides a safe and plentiful water supply and disposes of our garbage? In India, where science and engineering have not taken hold, garbage is handled entirely by human hands, by that group who constitute the caste of

"untouchables." They are "untouchable" because they carry filth and disease. We might, for example, call attention to modern science in communication and transportation. Would any one like to go back to the days when the only communication was mouth to mouth or by post-horse mail carriage, and the only travel was by foot or horse or crude canoe? Would you like to give up the comforts and conveniences of your modern home, or the thousand and one things which add interest and pleasure and safety to life, which are products of science?

Think for a moment where we would be if our ancestors, alarmed by the progress of science, had taken steps by codes or by public sentiment to stop its progress! You now would be lacking in these things which I have mentioned. And if we, in this day and generation, act to stop science, our descendants will similarly miss the corresponding new advantages which they might otherwise have.

Do not be tempted to think that we are now in a unique position, that these social and economic problems have been suddenly thrust upon us by science, or that science has done what it can for mankind and had better stop. Back in ancient Rome the labor unions were struggling with hours of labor, wages, scab labor just as we are to-day. Back in 1600 Bacon described our present economic and social problems and anticipated some features of the New Deal with remarkable accuracy when he wrote:

The first remedy or prevention is to remove, by all means possible, that material cause of sedition whereof we speak, which is, want and poverty in the estate (state); to which purpose serveth the opening and well-balancing of trade; the cherishing of manufactures; the banishing of idleness; the repressing of waste and excess by sumptuary laws; the improvement and husbanding of the soil; the regulating of

prices of things vendible; the moderating of taxes and tributes.

Forasmuch as the increase of any estate (state) must be upon the foreigner (for whatsoever is somewhere gotten, is somewhere lost), there be but three things which one nation selleth unto another—the commodity as nature yieldeth it, the manufacture, and the vecture, or carriage; so that, if these three wheels go, wealth will flow as in a spring tide.

And it cometh many times to pass, . . . that "the work and carriage is worth more than the material," and enricheth a state more; as is notably seen in the Low Countrymen who have the best mines above ground in the world.

Above all things, good policy is to be used, that the treasures and monies in a state be not gathered into few hands, for otherwise, a state may have a great stock and yet starve; and money is like much, not good except to be spread.

That great human benefactor, Pasteur, had a grasp of the truth when he wrote: "What really carries us forward is a few scientific discoveries and their applications."

Those in charge of this meeting, however, have chosen not to try to handle the whole field of science and its effects on society but to concentrate primarily upon just one aspect of these social effects, namely, the effect of science upon employment. This is a very live issue in these days of unemployment. It is here that a misunderstanding of the effects of science are likely to be most dangerous, because of possible political influences. Let us therefore consider very briefly what these effects are.

We will immediately admit that technological advances frequently result in labor-saving devices which throw large numbers of men and women out of work. This is distinctly unfortunate. Its evil effects can be mitigated by wise handling of these new devices; as, for example, the American Telephone and Telegraph Company has handled its introduction of automatic switching so as not to throw employees out of work.

But the other side of the picture is

immensely more significant in that the major result of science is the creation of entirely new industries which cater to new human desires, and which not only create a multitude of new jobs but which increase the per capita productiveness of men so as, first, to permit of an increasing population which is not limited by starvation and misery and, second, to reduce the hours necessary for men to labor to produce their necessities, and in this way to give them their opportunity to appreciate and experience some of the better opportunities of living which formerly were available only to those of wealth or of politically favored position.

Let me give a few examples of what I mean: Two years ago was celebrated the centennial anniversary of the discovery of the principles of electromagnetism which underlie practically all the modern electrical industry. According to the 1930 census there were in this country about 360,000 persons employed in the manufacture of electrical machinery and equipment, and about 676,334 people employed in the distribution of electrical materials, exclusive of the field of communication, namely, the telephone, telegraph and radio, which contribute in addition an immense number of workers.

Previous to the days of the automobile the 1900 census lists 976,000 individuals employed in the carriage and wagon industry, as manufacturers, drivers, draymen, livery stable managers, blacksmiths, etc. Thirty years later, with the advent of the automobile, based on innumerable scientific discoveries and engineering developments, the census lists 2,409,394 individuals engaged in this industry, exclusive of those involved in oil production. These figures have been corrected to allow for the increase in general population in the same interval. They show that while the advent of the

automobile produced technological unemployment among carriage and harness makers, yet the net result for labor has been a 250 per cent. increase in the number of jobs.

We frequently hear a great deal about the advent of labor-saving machinery on the road which has thrown out of work many men who would otherwise be employed in road construction. An amusing incident in this connection arose a couple of years ago in one of the state legislatures in the discussion of a public works bill for road construction. An amendment was offered to this bill providing that no labor-saving machinery should be used in the construction. The heated discussion of this amendment was brought to a close by the argument of *reductio ad absurdum* when a member of the legislature proposed a second amendment to the effect that laborers should be armed only with teaspoons in order that the number of jobs might still further be increased. What are the actual facts? Again corrected for increase in general population, the twenty years from 1910 to 1930, which witnessed the development of most of this labor-saving machinery, show an increase in the number of employees in road construction and repair from 203,000 to 339,000 individuals.

Such examples might be cited almost indefinitely. I would simply ask the question of where and when our serious unemployment problem should have struck if thirty years ago, to restrain technological unemployment in the carriage and wagon industry, legislation or codes had been enacted which would have inhibited the development of the automobile industry. Such an action would have eliminated the source of in-

come which now supports about 10,000,000 people of our population.

I believe, however, that the argument can be made more fundamental even than this. Man has an irrepressible curiosity for new knowledge. This is the fundamental basis and urge for scientific work. Man has also an irrepressible desire to use his knowledge for the accomplishment of his desires. This is the basis of invention and of engineering. These, I believe, are so fundamentally a part of human psychology that they can not be fettered, though their free exercise may of course be hampered or, on the other hand, be encouraged. The early Egyptians who discovered that a wheel driven by the current or by oxen could lift up water from the Nile for the irrigation of his fields did not worry because this invention relieved him of the job of carrying his water by hand. He simply took advantage of this invention to increase his range of interests and activities in other directions. He cultivated more land, he experimented in early science, he built monuments which he could not have done had he toiled morning to night carrying water by hand. Similarly, I believe that in the last analysis the extent of man's employment is governed by man's inherent desire and urge to do something. If science can relieve him of the more routine tasks, he is free to turn his attention to other things which excite his curiosity or satisfy his desires. In the last analysis, therefore, I believe that science simply increases man's power and the range of his activities. Most certainly, however, both theory and experience prove more conclusively that science has made jobs, not taken them away.